Algebra II: Finding Arithmetic Sequences 3

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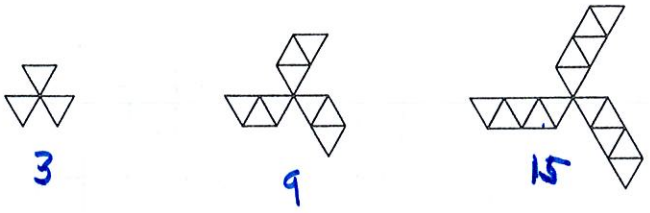
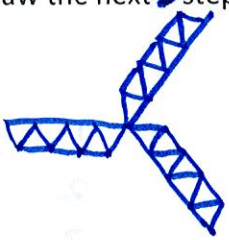
Date: 11-10-2014

1. Here's a pattern:



a) Draw the next step of the pattern.



b) Make a table for the pattern for n from 0 to 6, and then 20 and 100.

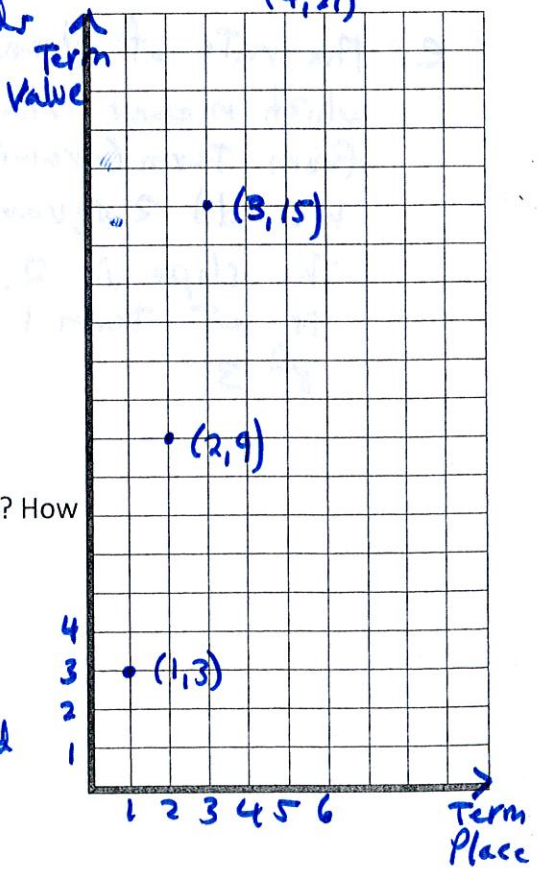
n	$f(n)$
1	3
2	9
3	15
4	21
5	27
6	33
20	117
100	597

c) Write the rule for the pattern in words and as a "formula." Connect both your verbal and algebraic descriptions to the actual pattern.

Each pattern term (drawing) has three less than 6 times the value of the place that term (drawing) holds in the sequence

$y = 6x + -3$
or
$y = 6n + -3$

d) Make a graph of the pattern.



e) What is the rate of change of this pattern? The starting point? How do those connect to the pattern itself?

Rate of change is 6 triangles added per each new term (drawing). The rate of change is the slope.
The starting point has 3 triangles and is term (pattern) #1.

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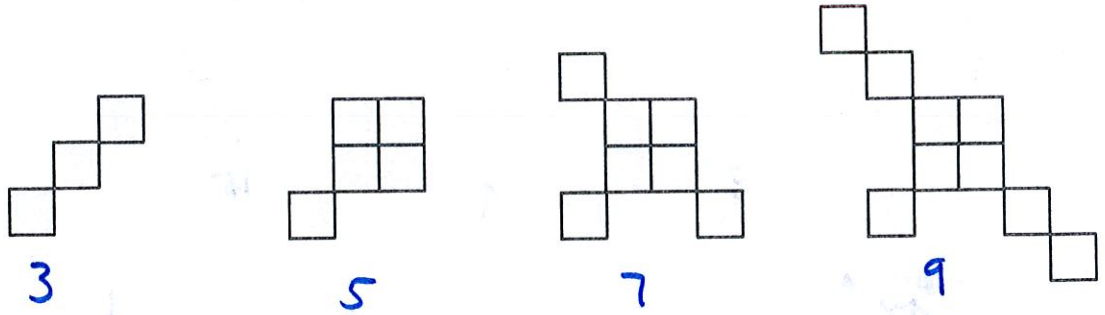
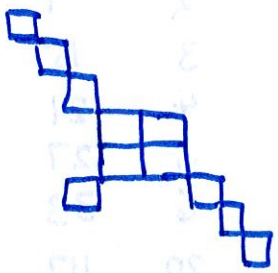
2. Repeat the process from #1 for this pattern:



a.



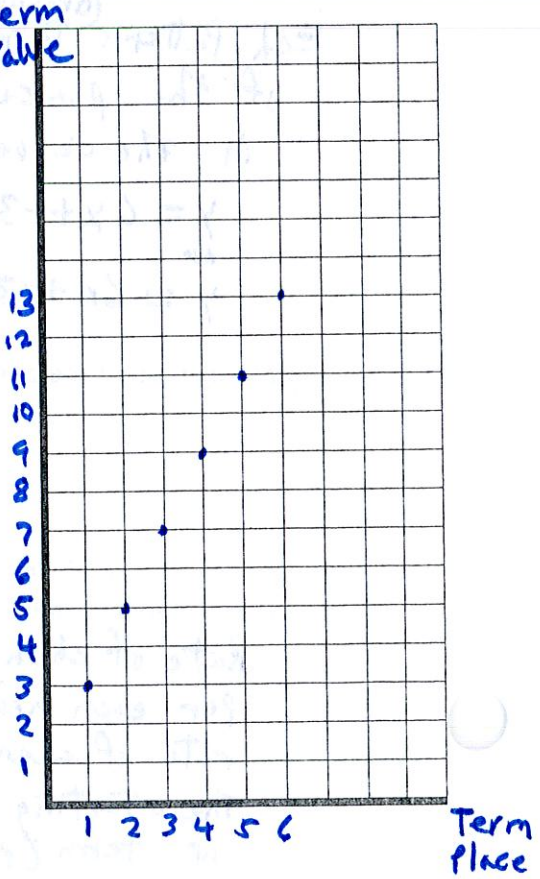
b. Table

n	$f(n)$
1	3
2	5
3	7
4	9
5	11
6	12
20	
100	

c. $y = 2x + 1$
or
$y = 2n + 1$

c. (continued) Each patter drawing (term) has as many squares as one more than twice the place value of that term.

d. Term Value graph



e. The rate of change is 2, which means that as we go from term (drawing) to term, we add 2 squares to the drawing. The slope is 2. The start point is at term 1 which has a value of 3.

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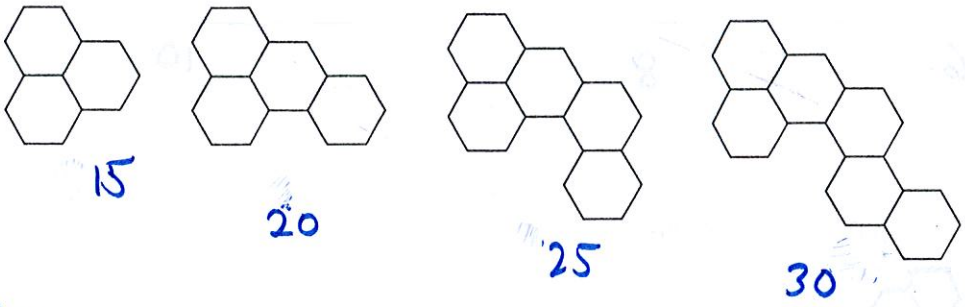
3. Repeat again for this pattern, except focus on the number of segments in each pattern, not the number of hexagons.



a.

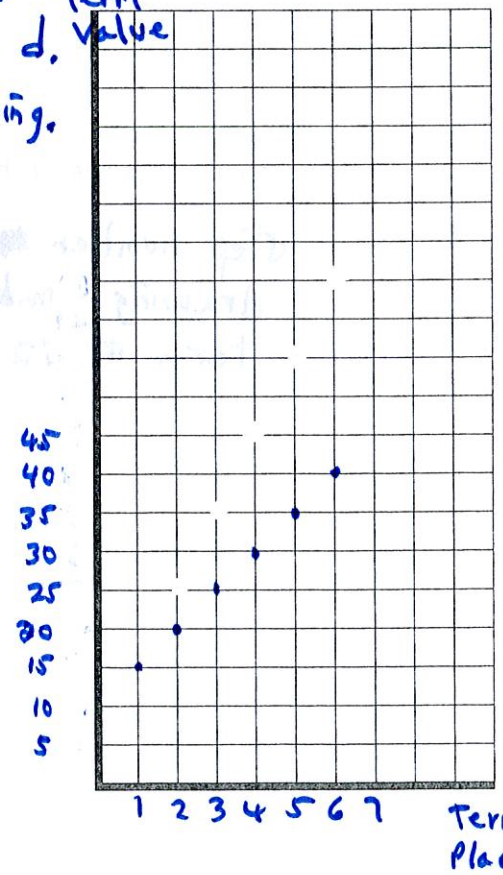
b.

n	$f(n)$
1	15
2	20
3	25
4	30
5	35
6	140
20	110
100	510

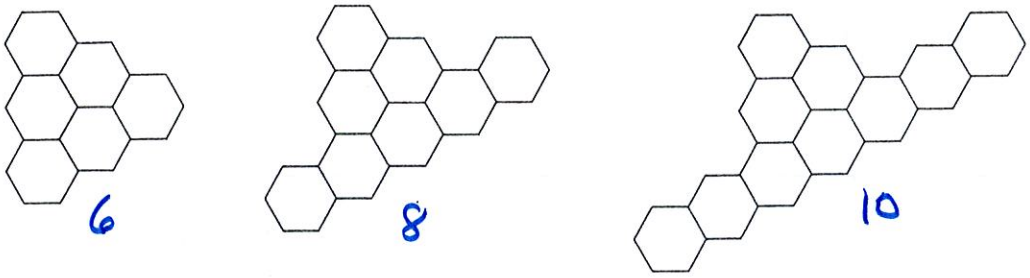
c. $y = 5x + 10$ or $y = 5n + 10$

Each drawing (term) has as many hexagons as 10 more than the 5 times value place value of the term.

e. the rate of change is 5, which means we add 1 hexagon as we go from d. term to term or drawing to drawing. The slope is 1.



4.



a) Draw what step 0 would look like:

b) Figure out the rule for this pattern, and then connect that rule back to the pattern itself.

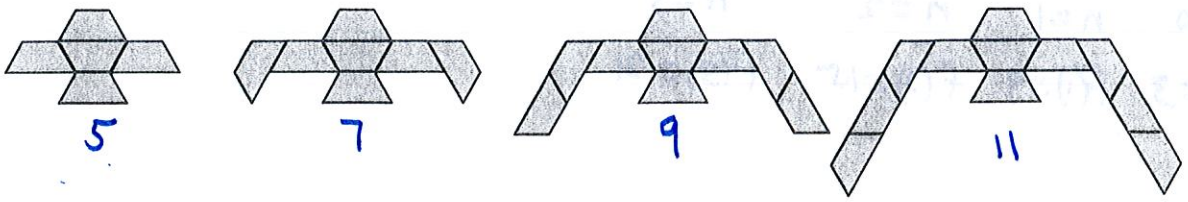
$y = 2x + 4$

when $x=1$, we have 6 hexagons for the first term
when $x=2$, we have 8 hexagons for the 2nd term

c) What step number has 108 hexagons in it?

step number 52
drawing number 52
term # 52

5.



a) Draw what step 0 would look like:

b) Figure out the rule for this pattern, and then connect that rule back to the pattern itself.

$y = 2x + 3$ The slope of the pattern is the rate of change which is 2 which means we are adding two trapezoids for each drawing (term)

drawing term

c) What step number has 171 trapezoids in it?

y = # of trapezoids

$y = 2x + 3$ becomes $171 = 2x + 3$ $168 = 2x$ $x = 84$

At step # 84 (drawing #84) (Term #84) There are 171 trapezoids

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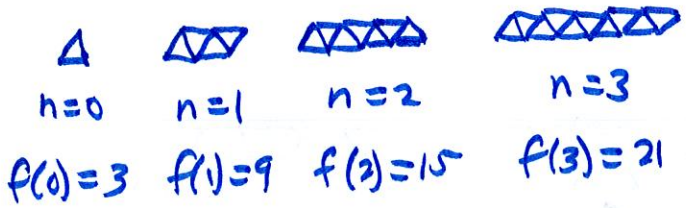
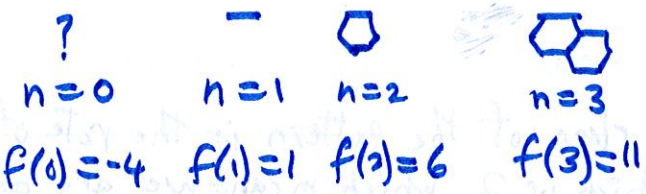
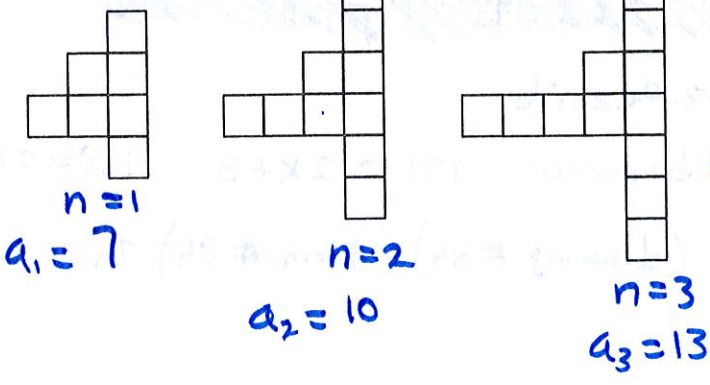
6. Draw steps 0, 1, 2, and 3 of a pattern whose rule is $f(n)=6n+3$.
Don't forget to connect the parts of your rule to the pattern you drew!



7. Draw steps 0, 1, 2, and 3 of a pattern whose rule is $f(n)=5n-4$.
Don't forget to connect the parts of your rule to the pattern you drew!



8. Which step number of this pattern had 199 squares? Show all of your thinking.



1. Rule
2. Formula
3. Equation

$a_n=3n+4$
$y=3n+4$

$a_n=199$ $y=199$

$199=3n+4$

$195=3n$

$65=n$

The 65th step has 199 squares.
The 65th drawing has 199 squares.
The 65th term has 199 squares.

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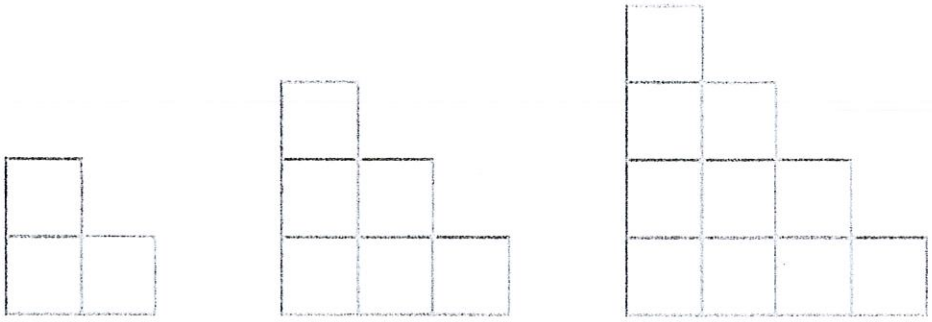
9. Determine the rule for each pattern below. Then, compare the patterns in #1 through #8 with these two. What's similar / different about all of them?

(Use the back if you need more room.)

a)



$n = 1$ $a_1 = 3$

$n = 2$ $a_2 = 6$

$n = 3$ $a_3 = 10$

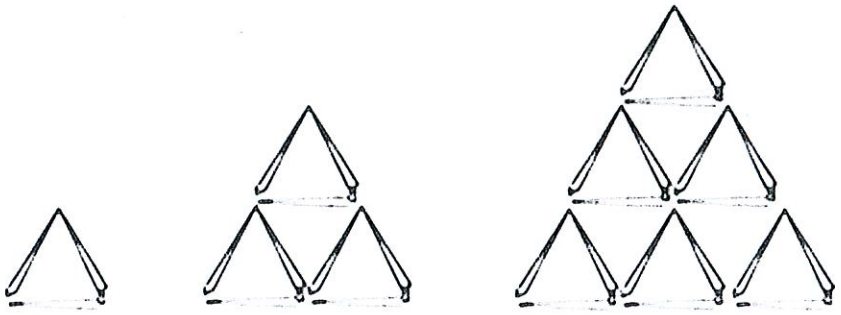
$n = 4$ $a_4 = 15$

This is not a linear patter since there is no common difference or common rate of change.

$a_2 = a_1 + 3$ $a_3 = a_2 + 4$ $a_4 = a_3 + 5$

Each time we go from one term to the next consecutive term, we add one more square than we added the previous time. We add 3, then 4, then 5, etc...

b) (number of sticks)



$n = 1$ $a_1 = 3$

$n = 2$ $a_2 = 9$

$n = 3$ $a_3 = 18$

$n = 4$ $a_4 = 30$

This is not a linear pattern. There is no common rate of change. Each time we go from one term (drawing) to the next, we add 3 more than we added the term before. We add 6, then we add 9, then we add 12, then we add 15, etc...